VIBRATION ABSORBING MATERIAL FOR HANDLES OF SPORTING EQUIPMENT

CROSS-REFERENCE TO RELATED APPLICATION

This application is a continuation in part of application Ser. No. 08/560,699, filed Nov. 20, 1995, now U.S. Pat. No. 5,653,643.

BACKGROUND OF THE INVENTION

U.S. application Ser. No. 560,699, filed Nov. 20, 1995, now U.S. Pat. No. 5,653,643 discloses techniques involving the provision of vibration absorbing material for handles of sporting equipment. A particularly useful example of such equipment is golf clubs wherein the vibration absorbing material is provided on the gripping area of the club. Other types of sporting equipment and devices having handles to be gripped also may incorporate the vibration absorbing material.

The techniques disclosed in Ser. No. 560,699 include the provision of an inner core around the shaft of the handle in the gripping area. The inner core has a plurality of spaced rigid projections provided in the gripping area to thereby provide rigidity during use of the article. The vibration absorbing material surrounds the inner core with its support structure so that the vibration absorbing material is the sole material contacted by the user when gripping the handles during the use of the article. The vibration absorbing material has various characteristics which are particularly desirable for use of the article.

SUMMARY OF THE INVENTION

An object of this invention is to provide variations in the techniques and structures disclosed in application Ser. No. 560,699.

In accordance with one embodiment of this invention the inner core is integral with the shaft and includes its integral inner support structure having the plurality of spaced rigid projections which extend in a pattern longitudinally down the length of the gripping area. The pattern may be longitudinal fins, horizontal fins or any other type of pattern. The vibration absorbing material is disposed over the inner support structure in the manner of application Ser. No. 560,699.

In a further embodiment of this invention a sleeve is heat shrunk onto the shaft and the combined inner core and outer vibration absorbing material is then secured over the sleeve. The sleeve may contain an adhesive either as a separate material or from the tackiness of the sleeve when the sleeve is heated to assist in mounting the combined inner core and outer vibration absorbing material on the sleeve.

THE DRAWINGS

FIG. 1 is a side elevational view partly in section of an elongated handle of athletic equipment, such as a golf club, in accordance with this invention;

FIG. 2 is a cross sectional view taken through FIG. 1 along the line 2—2;

FIG. 3 is a side elevational view partly in section of a modified form of handle of athletic equipment, such as a golf club, in accordance with this invention;

FIG. 4 is a cross-sectional view taken through FIG. 3 along the line 4—4;

FIGS. 5–6 are views similar to FIG. 4 showing alternative inner core structure;

FIG. 7 is a top plan view of the inner core used in the embodiment of FIGS. 3–4;

FIG. 8 is a front elevational view of the inner core shown in FIG. 7 illustrating how a cap is attached;

FIG. 9 is a cross sectional view of the inner core shown in FIG. 8;

FIG. 10 is a top plan view of the gripping structure or outer core used in the embodiment of FIGS. 3–4;

FIG. 11 is a side elevational view of the gripping structure shown in FIG. 10;

FIG. 12 is a cross-sectional view taken through FIG. 11 along the line 12—12;

FIG. 13 is a side elevational view of a portion of the combined inner core and outer core or gripping structure shown in FIGS. 7–12;

FIG. 14 is a cross sectional view in elevation of the combined structure shown in FIG. 13 with the sleeve and shaft omitted;

FIG. 15 is a cross sectional view taken through FIG. 13 along the line 15—15 also showing the sleeve and shaft; and

FIGS. 16–19 are side elevational views showing steps in the mounting of the components to a golf club shown in FIGS. 3–15 in accordance with this invention.

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Fig. 20 is a side elevational view showing the application of the vibration absorbing material of this invention in the form of a wrap.

DETAILED DESCRIPTION

The present invention involves variations in the techniques shown in U.S. application Ser. No. 560,699 filed Nov. 20, 1995. All of the details of that application are incorporated herein by reference thereto. The present description will be based primarily upon the variations to those techniques.

FIGS. 1–2 illustrate a handle **10** of a hand held article, such as an article of athletic equipment, which includes a gripping area **12** extending from the outer end of the handle around a portion of a shaft **14**. The gripping area would be gripped by the user in a squeezing action.

In the embodiment of FIGS. **1–2** the shaft **14** has an integral inner core **16** which includes an inner support structure in the form of projections **18** around and integral with the inner core. The shaft and inner core may be made of metal, graphite or a suitable plastic. The invention may be practiced where the inner core **16** and shaft **14** are actually made of separate materials permanently secured together such as by welding or any other permanent form of fastening. Thus, it might be possible, for example, to form the inner core **16** of a nylon or other suitable plastic material as an insert which would be permanently secured to the shaft so that the inner core and shaft are functionally integral.

The inner support structure has a plurality of spaced rigid projections **18** in the manner described in application Ser. No. 560,699. A flexible vibration absorbing material **20** is provided around inner core **16**.

Vibration absorbing material **20** has an outer surface which comprises the gripping surface of the handle. The vibration absorbing material is made of the material disclosed in application Ser. No. 560,699 and includes various characteristics that make it particularly desirable to function as a gripping material. For example, the outer surface of the vibration absorbing material **20** is non-porous and tacky. The material **20**, itself has a hardness of less than 40 durometer reading from a Durometer Class D device. A coefficient of friction of at least 0.6 (preferably 0.6–1.0) and a dampening of vibration greater than 55% as derived from Accelerometer Testing using Lab Tech Software.

Where the vibration absorbing material **20** is thin, such as by being on an inner core having relatively small rigid projections **18**, the hardness could have an upper limit of 60 durometer reading and the minimum dampening of vibration could be 25%. Accordingly, the hardness is preferably less than 40 durometer reading but can be as high as 60 durometer reading and the dampening of vibration is preferably greater than 55%, but can be as low as 25% with the invention being broadly practiced with values between those hardness and dampening of vibration parameters.

Materials which have characteristics usable with the invention are silicone such as silicone sealants and similar type polymer acrylic and modified rubber compounds. Reference is made to U.S. Pat. Nos. 4,483,972 and 4,417,042 the details of which are incorporated herein by reference thereto with regard to the composition of suitable materials.

As best shown in FIG. **2** the inner support structure which includes the projections **18** is located inwardly of the outer surface of the vibration absorbing material **20**. The vibration absorbing material **20** and the inner support structure are secured together by the projections **18** extending into the vibration absorbing material **20**. The projections **18** are spaced peaks with spaced valleys therebetween. The vibration absorbing material is distinct and separable from the inner support structure. As also shown in FIG. **2** the vibration absorbing material **20** completely covers the projections **18** to render the outer surface of the vibration absorbing material as the sole user contacting and gripping surface in the gripping area during use of the article.

The rigid projections **18** of the inner support structure **16** are arranged in a pattern which extends longitudinally the length of the gripping area. The projections may be fins, ribs or channels and can be uniformly, randomly or otherwise strategically placed on the surface of the inner structure. In a preferred practice of the invention the projections are longitudinal with respect to the longitudinal axis of the shaft. The invention, however, may be practiced where the projections are horizontal or in other orientations creating, for example, a patterned configuration. In the preferred practice of the invention, however, regardless of the disposition of the projections, the projections should be located along the length of the gripping area as viewed longitudinally with regard to the longitudinal axis of the shaft thereby providing rigidity during use of the article. Thus, in use of the article there would be, for example, both lateral and longitudinal rigidity as a result of the rigid projections.

The thickness of the projections could be uniform patterned or of tapered design, height and thickness.

The embodiment of FIGS. **1–2** is particularly useful with a golf club. By having the premolded shaft bearing the design characteristics of the inner structure, the overall weight of the grip can be reduced from 35–50 grams down to 15–35 grams. Preferably, adhesives are added to the outer surface of the inner core to assure a firm securement of the outer grip.

As shown, for example, in FIGS. **2**, **4–6** and **15** the rigid projections of the inner core are in the form of a continuous series of peaks and valleys. The thickness of the vibration absorbing material **20** at each valley is greater than twice the thickness at the peaks. The outer ends of the peaks are closer to the outer surface of material **20** than any other portion of the inner core is to the outer surface.

FIGS. **3–19** illustrate a further embodiment of this invention wherein the shaft **14** is provided with a sleeve **30**, with some of the figures showing components of the embodiment. The inner core **16** in turn surrounds sleeve **30** with the

outer core or gripping material **20** around inner core **16**. Gripping material **20** would have the same characteristics as in the embodiment of FIGS. **1–2**. This variation of the invention would essentially be similar to that disclosed in application Ser. No. 560,699 except that this variation of the invention includes the sleeve between the inner core and shaft.

In this embodiment the inner structure has a Durometer Class D Device reading of between 0.25 and 0.95 and has a more rigid stiffer feel to the material than the outer structure **20**, but is not brittle.

FIGS. **4–6** and **9** illustrate various structures for the inner core **16** with its projections **18** which create spaced peaks (projections) and valleys therebetween. The inner surface of the grip material **20** would complement the outer surface of inner core **16** to accommodate the projections **18**. Similarly, as illustrated in FIG. **6** sleeve **30** could have a non-cylindrical outer surface which complements the inner surface of inner core **16**. Alternatively, as shown in FIGS. **4–5** the outer surface of sleeve **30** and the inner surface of inner core **16** could complement each other by both surfaces being cylindrical.

The structure of the inner core **16** and its projections **18** is illustrated in FIGS. **7–9**. FIGS. **10–12** illustrate the gripping structure **20** that would fit around inner core **16**. FIG. **14** illustrates the inner core **16** and gripping structure **20** in its assembled condition, while FIG. **15** illustrates the final assembly which also includes the shaft **14** and sleeve **30**.

FIGS. **16–19** illustrate a preferred practice of the invention for mounting the components of the second embodiment. Initially the inner core **16** and outer core or gripping material **20** would be molded together to form the combined unit or outer structure indicated by the reference numeral **32**. As shown in FIG. **16** the outer structure **32** is slid down the shaft past the grip area and can slide, for example, all the way down to the club head **34**.

The sleeve **30** would then be slid over the end of the shaft and aligned with the very top edge of the shaft as shown in FIG. **17**. Sleeve **30** is preferably of uniform thickness and cylindrical in shape when mounted on a cylindrical shaft. When mounted on other types of equipment, such as a baseball bat, the sleeve would have a conforming shape, but still is preferably uniform in thickness.

After the sleeve is properly located on the shaft, the sleeve is heated. In a preferred practice of the invention a conventional hair dryer **36** could be used as shown in FIG. **18** to heat and shrink the sleeve. Preferably, any suitable material such as a suitable plastic, polymer or silicone could be used for the sleeve **30** wherein the material is heat shrunk to firmly grip the shaft by being heated at a temperature of at least 120° F. If desired, adhesive could be applied around the shaft which is activated by the heat to further assure firm securement of the sleeve to the shaft.

Once the sleeve **30** is heat shrunk onto the shaft, the outer structure **32** is slid upwardly over the sleeve **30** until the upper edge of the outer structure **32** is generally coterminous with the upper edge of the sleeve and shaft as shown in FIG. **19**. If desired, a mild adhesive may be provided on the outer surface of the sleeve, either as a separate material or as a result of tackiness from the sleeve material wherein the tackiness is created by heating the sleeve.

As shown in FIGS. **7** and **8** the outer end **38** of the inner core **16** includes a recess **40** for receiving a cap **42**. Accordingly, as shown in FIG. **19**, once the outer structure **32** is mounted over the sleeve **30** the cap **42** is then snapped

into the recess to provide a finished outer end of the club. Cap 42 may be custom made to carry a monogram, corporate logo or other markings.

The provision of the sleeve 30 is advantageous not only in providing a manner of securing the gripping structure to the handle but also functions to hide imperfections in the shaft due to tape residue, dents, chips, scratches, etc. The use of the sleeve 30 which is heat shrunk provides a strong lock of the sleeve 30 to the shaft 14 wherein the heat shrunk sleeve 30 is locked in size and does not expand. The sleeve 30 thus maintains its structural features when shrunk to the shaft. This embodiment of the invention thus provides techniques where one size fits all golf club shafts. The invention also eliminates the need for tape, while the use of adhesives are optional.

Although the invention has been particularly described with respect to golf clubs the invention may also be practiced with other equipment having a grip area. Examples are athletic equipment such as racquets (tennis, racquetball, squash, etc.), hockey (field, ice, street, etc.), bats, javelins, lacrosse sticks, etc. Other examples are tools (shovels, rakes, brooms, hammers, wrenches, pliers, screwdrivers, knives, etc.) or handlebars or the various other types of equipment referred to in application Ser. No. 560,699.

With this various devices the innermost structure, which supports the inner core and vibration absorbing material, is the shaft portion of the device.

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As illustrated in FIG. 8 inner core 16 tapers in diameter from one end to its other end. FIG. 11 similarly shows the vibration absorbing material 20 to taper in diameter from one end to its other end. FIGS. 16-19 show the combined unit 32 formed from gripping structure 20 around inner core 16 to taper from one end to its other end.

As described in U.S. application Ser. No. 560,699 filed Nov. 20, 1995, now U.S. Pat. No. 5,653,643 various uses could be made of the vibration absorbing material. FIG. 20 illustrates the material being applied to a fibreglass mesh to form a tacky tape 132 which would be wrapped around a handle 134. The material could also be applied to a tape or cloth or to itself. As illustrated in FIG. 20 the handle could be a racquet, fishing rod, bat, etc., rather than a golf club. The application techniques would depend on the sport (e.g. tennis, lacrosse, etc.)

The invention may also be practiced to improve the performance of a golf club by providing the vibration absorbing material as a filler within the hollow core of the shaft or handle. This could be in addition to or instead of using the material as a grip.

The material can also be applied to putters, hockey sticks, shoulder pads, etc.